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ENTER THE DRACO: CHINA AS AN EMERGING SPACE POWER

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On 22 November, 2000 the Information Office of the State Council of the People's Republic of China published *China's Space Activities: A White Paper*. This was the country's first official overview of its emerging space program to be released to the public. The publication was also the latest in a series of significant developments over the last two years in a space program whose rapid development is reminiscent of the golden age (1959-1973) of the American National Aeronautics and Space Administration (NASA). Since the launch of its first experimental satellite in April of 1970, China has developed a powerful space industry that includes command and control facilities, a successful family of launch vehicles, numerous satellite constellations, and a fledgling manned space program. Indeed, China may be only months away from being capable of launching one of its own citizens (*taikonaut*) into outer space, making it only the third country in the world to do so. In addition, China's recent White Paper has indicated that the future development of its space program will include global navigation systems, earth observation satellites, independent satellite telecommunications, regular manned space flight, and perhaps even an independent space station. Given the current trends in development it is likely that China will assert itself as a true space power by the end of the next decade.

The 'Long March' to Space

The Chinese space program officially began on 8 October, 1956 when the Central Committee of the Communist Party, presided over by Mao Zedong, decreed the foundation of the Fifth Research Academy of the Ministry of National Defence and assigned it the task of developing modern rocket and satellite technology. Headed by Dr. Tsien Hsue-shen, a graduate of the Massachusetts Institute of Technology (MIT), the California Institute of Technology (CalTech), and a co-founder of the American Jet Propulsion Laboratory (JPL), the Fifth Academy slowly evolved amidst the upheavals of the Great Leap Forward and the subsequent Cultural Revolution. Eventually ten research laboratories and two branch academies were established. But despite Tsien's best efforts China's early space program only truly advanced with massive assistance from the Soviet Union.

The loss of Russian assistance in August 1960 following a series of border conflicts along the Sino-Soviet border greatly hindered China's space program. More than two hundred joint projects that had been initiated between the two countries were cancelled and China was left to continue work on its own. While the Soviets moved ahead in space research during the 1960s, China's efforts stalled amid the domestic turmoil of the Cultural Revolution.

China launched its first earth satellite, *Dong Fang Hong 1* ('The East is Red 1') on 24 April, 1970. In the midst of political upheaval and great poverty, China had achieved a tremendous scientific breakthrough, astounding both its Pacific neighbours and the West. The successful launch of *Dong Fang Hong 1* justified years of investment in China's space program and paved the way for further and more ambitious projects.

The *Fanhui Shi Weixing* (FSW), or Recoverable Satellite Program, also referred to as Project 911, represented a significant advancement in China's space program. Project 911 confirmed China's ability to develop effective heat shields for its satellites, as

well as successfully track and retrieve a re-entering space object. It may also have been China's first photo-reconnaissance satellite program. Like many previous programs the exact aim of the project was not made public.

The first attempt at launching an FSW satellite in November of 1974 ended in disaster. A fracture in the wire connecting the gyro to the control system rendered the rocket unable to stabilize itself during flight, causing the *Long March 2* to sway wildly out of control shortly after lift-off. With no way to save the rocket, the range safety officer was forced to destroy it.

China's first space launch failure led to high-level political intervention in the preparation for the second attempt. Quality controls on the construction were so strict that the next launch did not occur until over a year after the first failure, and the launcher had been so modified that it merited a new designation – *Long March 2C*. The second launch was carried out on 26 November, 1975 and after forty-seven orbits the FSW satellite was retrieved with minor difficulty. China had successfully launched and retrieved its own satellite, marking yet another significant milestone in its space program.

Of all the projects undertaken by China during the 1980s, the successful development and deployment of communications satellites was considered its greatest achievement. After leasing bandwidth on a number of Western satellites the Chinese government was convinced that it must obtain its own indigenous system for satellite based communications. Such a system would create unprecedented links for the historically isolated country and offer China the opportunity to modernize even more quickly. In April of 1975 an ailing Mao authorized Project 331, China's first operational satellite communications system.

As with other space projects, the Chinese satellite communications project relied heavily on foreign design assistance. In the early 1980s China invited a high-level American aerospace team to visit its space facilities and discuss ways to improve space-based communications. In 1983 Italy was invited to build a three-meter ground station in Beijing for its own *Sirio* satellite, which allowed the Chinese to further study satellite communications systems.

Project 331 had many performance obstacles to overcome. The increased size of the communication satellites (915 kg) necessitated a new heavy-lift launcher, new engines, a new launch site that could reach equatorial orbit more easily despite China's northern latitudes, and the deployment of China's satellite tracking ships. Though frustrating and challenging, China successfully overcame each of these problems and placed its first *Dong Fang Hong* (DFH) communication satellite in geosynchronous orbit on 12 April, 1984. A second satellite was orbited in February of 1986, providing thirty television stations. Further DFH satellites provided 8000-call capacity coverage to over 90 percent of China, effectively linking 83 percent of Chinese citizens to each other.

PROJECT 921

Though recent events have pushed China's manned space program into the spotlight, the project - officially designated 921 - has been under development for several years. The first potential tests of a Chinese manned spacecraft design may have occurred during the FSW recoverable satellite program. The spacecraft launched during this program had an overall mass sufficient for a basic manned capsule (2500 kg), however the published photographs of the re-entry vehicle appeared a bit too small for a human occupant.

In February of 1978 an article in the Chinese technical journal *Navigation Knowledge* acknowledged that work had begun on the technology necessary for manned space flight. This was followed by an announcement in November of 1978 by Jen Hsin-Min, head of the Chinese space agency, that it was also working on the concept for a space station.

A paper presented to the International Astronautical Federation in February, 1992 by scientist Xiandong Bao of the Shanghai Astronautics Bureau mapped out the most recent studies for the development of a four-man capsule to be launched by a modified CZ-2E rocket. In August of that year China successfully flew its Recoverable Test Satellite (RST) number 13. The news agency *Xinhua* reported that the satellite was of a new design and that it had "major significance for expediting China's scientific exploration and technological experimentation, as well as for developing the technology of carrying people into space". This may have been an unduly optimistic report; the Chinese were still well away from mastering orbital flights. In October of 1993, during the flight of RST 15, China's mission control accidentally allowed the return capsule to misalign and instead of de-orbiting, the burn pushed the satellite into an even higher orbit. The capsule and its contents were lost, highlighting the difficulties that still lay ahead for manned space flight.

Visits by Chinese president Jiang Zemin to Russia's flight control centre in Kaliningrad and Yekaterinburg in 1994 reinforced China's desire to pursue manned space flight. Following these visits orders were issued by the Chinese government to accelerate Project 921-1 (manned spacecraft) and send a *taikonaut* into orbit by Octo-

ber, 1999. Arrangements were also made to allow for Chinese *taikonauts* to start training at Star City, Russia.

Despite claims by China that the 921-1 spacecraft was an indigenous effort, the design and specifications of the craft made it obvious that a great deal of assistance had come from Russia. Aside from the physical design similarities, the 921-1 spacecraft bore considerable resemblance to the Russian Soyuz manned vehicle in terms of dimensions and overall mass. The 921-1 also employed maneuvering and re-entry design features similar to those on Russian spacecraft.

On 21 November, 1999 China's unmanned spacecraft, *Shenzhou*, was launched on a modified CZ-2E (F) rocket from the *Jiuquan* Satellite Launch Center in northwest China's Gansu Province. It was quickly recovered after a 21-hour, 14-orbit flight when the capsule safely touched down in Inner Mongolia. The successful mission marked yet another milestone in China's rapidly advancing space program and confirmed that it was soon ready to send one of its own into orbit.

While the space agency missed the October, 1999 date (meant to coincide with the 50th anniversary of the Chinese Revolution) for sending a *taikonaut* into orbit, it clearly demonstrated that it was ready to do so in the very near future. In July of 2000 the Chinese government announced that it would conduct at least three or four more unmanned test launches before sending a *taikonaut* into orbit, rescheduling the first Chinese manned mission for 2002.

THE COX REPORT: CO-OPERATION OR COLLUSION?

China has drawn considerable attention to its space activities over the past two years, beginning with the notorious official inquiry by the US government into US commercial space ventures with Chinese launch services. An in-depth investigation headed by California Republican Senator Christopher Cox revealed that two American satellite manufacturers, Hughes and Loral, had committed a number of technology export violations following two failed launches of US commercial satellites aboard Chinese launchers in the mid-1990s. In a misguided attempt to assist China's launch industry, both companies transferred technical information that led to significant improvements to China's CZ rocket family without license or authorization and in direct violation of the International Traffic in Arms Regulations (ITAR). Moreover, the intervention of Loral and Hughes in China's launch problems resulted in the country's ability to launch heavier military payloads would otherwise have been possible. The most damaging development was that the recommended improvements to the CZ guidance and fairing (or nose cone) were equally applicable to a number of Chinese short-range and intercontinental ballistic missiles.

The Cox Report revealed not only Chinese space-related industrial espionage in the United States and in China, but also the potential acquisition and theft of nuclear secrets, rocket design information, and re-entry vehicle data from the American space industries. The list of potential breaches in US national security required three full volumes to detail, and resulted in a number of immediate alterations to usual American practices. In the end, the report stirred a degree of paranoia that China had become the new main adversary in a possible second Cold War.

Acrimonious Sino-American relations following the 1999 war in Kosovo - during which US aircraft mistakenly bombed China's embassy in Belgrade - led to a small demonstration of Chinese space power. China's media reported in October that its military satellites were actively monitoring increased US naval movements in the Asia-Pacific region - particularly in the South China Sea and Taiwan Strait. It also claimed a capability to use its military satellites to guide missiles onto American and Taiwanese naval targets. Though neither confirmed nor denied by the West, it was an impressive suggestion of space power and seemed to confirm the remarkable rapidity with which China had advanced its space program.

China's recent space activities also had other geostrategic implications. On 4 October, 1999 Long Leihao, Deputy Director of the China Satellite Transport Technology Research Academy (CSTTRA), announced plans to construct a new launch and satellite tracking site on Hainan Island in the South China Sea. The launch and recovery safety zone would easily extend over the *Xisha Qundao* (Paracel Islands) - an area claimed by China, Taiwan, and Vietnam. China could now justify a naval presence in the area to support its space launch activities, even if such a presence could be perceived as a direct threat to its neighbours.

Such moves will undoubtedly shift the regional balance of aerospace power in China's favour, and may even spark a new space race in Asia if it has not already done so. India has already responded to China's evolving space program with one of its own, and is currently capable of building and launching its own light and heavy payloads from indigenously-built rockets. Other Southeast Asian countries have also orbited their own commercial satellites or have participated in joint ventures with other nations and agencies.

COMMERCIALIZATION AND FUTURE STRATEGY

Despite accusations of global espionage, China has forged ahead with an increasingly commercialized space industry. It has designed an effective range of launchers (arguably using American technology) capable of reaching most orbits, and has achieved a high degree of self-sufficiency in most satellite systems. China began commercial space operations in April of 1990 with the launch of *Asiasat 1* from Xichang Satellite Launch Center aboard a CZ-3 rocket. As of October, 2000 China had successfully launched 27 foreign-built satellites, including those from Pakistan, Australia, Brazil, Sweden, and the United States. To reinforce these successes, China has mapped out an aggressive space strategy for the first two decades of the new millennium that will firmly establish itself as one of the world's three largest space powers. The space policy White Paper outlined a number of short- and long-term development targets for the Chinese space program. Beijing has identified three main goals for the next decade, the first of which is the establishment of a comprehensive surveillance-from-space program. In addition to those satellites already deployed, China has sought to expand its surveillance capabilities - particularly in remote sensing and ocean surveillance. Beijing's second objective involves the establishment of an independent satellite broadcasting and telecommunications system that will replace the current mix of domestic and foreign-owned commercial communications services. Third, China plans to establish its own space-based global position system (GPS) navigation constellation and related terrestrial applications. On 30 October, 2000 China launched the first *Beidou* Navigation Test Satellite (BNTS-1). This will form the basis of a first-generation global positioning system (GPS). If successful, a full constellation of satellites will be orbited during the next decade, opening up much of China's difficult interior to more accurate navigation.

China has identified further space goals beyond the next decade. The government will continue to evolve its space industry and the global marketing of Chinese space applications. This will not only assist China's economy but it also may be used as political capital in what China has termed the "strengthening of the comprehensive national strength".

According to the White Paper, China's long term goal is to develop a multi-functioning and multi-orbit space infrastructure composed of various satellite systems that will assist with policy-planning and the development of the state. With such a system firmly in place, China believes it will be able to advance another of its long-term goals – routine manned space flight. With the continual improvement of its launcher family, China has stated in the White Paper that its manned efforts are gravitating towards, "the exploration of the moon".

The White Paper also stated that many of China's future space activities would depend on a continued high degree of international co-operation. Since 1985 Beijing has signed agreements with a dozen countries including the United States, Italy, Germany, France, Japan, Sweden, Argentina, Brazil, Ukraine, and Chile. It has also fostered significant regional co-operation including the sponsorship of the Asia-Pacific Multilateral Space Technology Cooperation Symposium.

CONCLUSION

Given all of this effort, both indigenous and international, there can be no doubt that China has entered the elite club of Earth's space-faring nations. With over sixty launches, a confirmed manned space program, and a clear statement of policy outlining plans for a complete space infrastructure, Western nations engaging the country must make careful note of the emerging space power that is China.

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